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JURASSIC DINOSAURS IN NEW MEXICO

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Abstract—New Mexico has a sparse but growing record of Jurassic dinosaurs. The oldest records are theropod footprints and a sauropod vertebra from the Middle-Upper Jurassic Summerville Formation. The footprints are part of a widespread large theropod-pterosaur ichnofacies in the Summerville and equivalent strata in the southern Western Interior. The sauropod is one of the oldest North American sauropods. The oldest theropod eggshell is from the Upper Jurassic Morrison Formation in New Mexico. Most New Mexican Jurassic dinosaurs are from the Upper Jurassic Morrison Formation and include *Apatosaurus, Diplodocus carnegiei, Diplodocus* (=*Seismosaurus*) *hallorum, Camarasaurus, Allosaurus,* and *Stegosaurus.* These dinosaurs are part of a homogenous Morrison dinosaur chronofauna found throughout the Western Interior and characteristic of the Comobluffian land-vertebrate faunachron.

INTRODUCTION

New Mexico has a limited, but growing, record of Jurassic dinosaurs. These fossils come from across the northern half of the state (Fig. 1), but are limited to two stratigraphic units: the Middle-Upper Jurassic Summerville and the Upper Jurassic Morrison formations. Here, we briefly review New Mexico's Jurassic dinosaurs, largely to update earlier reviews by Lucas and Hunt (1985), Hunt and Lucas (1993) and Lucas et al. (1996).

JURASSIC DINOSAUR TRACKS

There are two records of Jurassic dinosaur footprints from New Mexico:

1. Anderson and Lucas (1996), Lucas and Estep (1996), and Lockley et al. (1996) documented large theropod tracks ("*Megalosauripus*") from the Summerville Formation near Navajo Peak in Rio Arriba County, north-central New Mexico. These tracks fit into the concept of a large theropod-pterosaur (*Pteraichnus*) track ichnofacies present in the Summerville Formation and equivalent units in the southern Western Interior (Lockley et al., 1996).

2. Lucas et al. (1990) reported two theropod tracks from the "lower part of the Morrison Formation" at Romeroville in San Miguel County, north-central New Mexico. These strata have recently been reassigned to the Summerville Formation (Lucas et al., 1999). These tracks also are consistent with the large theropod-pterosaur track ichnofacies of the Summerville Formation.

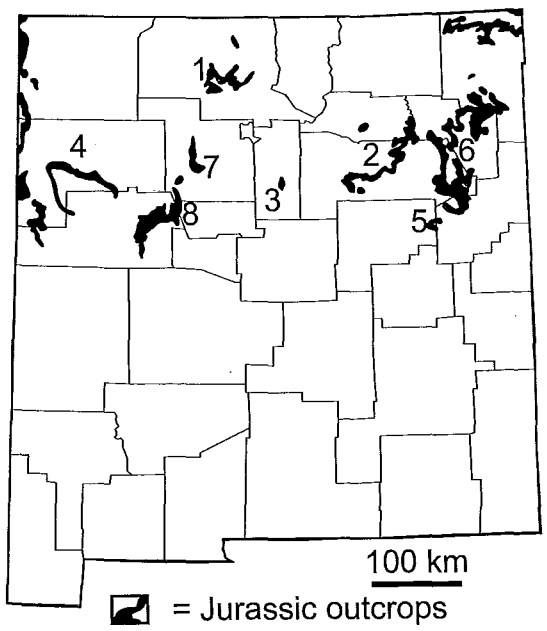

FIGURE 1. Map showing localities of Jurassic dinosaurs in New Mexico: 1, Navajo Peak; 2, Romeroville, 3, Hagan basin; 4, Grants uranium belt; 5, Bull Canyon; 6, Ute Creek; 7, San Ysidro; 8, Laguna.

SUMMERVILLE FORMATION DINOSAUR BONES

A single caudal vertebra identified as *Camarasaurus* sp. is known from the Summerville Formation in the Hagan basin of north-central New Mexico (Hunt and Lucas, 1993; Lucas et al., 1995). This, and other Summerville sauropod records (Gillette, 1996), are the stratigraphically lowest, and thus oldest, North American occurrences of sauropod body fossils. *Camarasaurus* is probably the most abundant Morrison Formation sauropod, and is widely considered indicative of a Late Jurassic age. The presence of *Camarasaurus* thus supports a Late Jurassic age for the upper part of the Summerville Formation.

MORRISON DINOSAUR EGGS

Bray and Lucas (1997) documented dinosaur eggshell from the Brushy Basin Member of the Morrison Formation in the Rio Puerco drainage of central New Mexico. This is the oldest theropod eggshell.

MORRISON DINOSAUR BONES

Almost all Jurassic dinosaur body fossils from New Mexico are from the Morrison Formation. Lucas and Hunt (1985), Hunt and Lucas (1993), and Lucas et al. (1996) reviewed this record, obviating the need for a detailed review here.

Most New Mexican Morrison Formation records are of isolated and fragmentary bones, in both the Salt Wash and Brushy Basin members. These are occurrences across the Grants uranium belt and at Bull Canyon and Ute Creek in northeastern New Mexico (Fig. 1). These records include isolated occurrences of *Allosaurus, Stegosaurus,* an ornithopod and unidentifiable sauropods (Hunt and Lucas, 1993; Lucas et al., 1996). Two key areas produce more complete and even partially articulated specimens—San Ysidro and Laguna.

San Ysidro

Several sites in the San Ysidro area of Sandoval County in north-central New Mexico yield the sauropods *Camarasaurus supremus*, *Diplodocus carnegiei* and *Diplodocus* (=*Seismosaurus*) *hallorum* (Rigby, 1982; Gillette, 1991, 1994; Hunt and Lucas, 1993). All of these sites are in the upper part of the Brushy Basin Member (Fig. 2). The most notorious of these dinosaurs is *Diplodocus hallorum* (Gillette), previously misrepresented as (1) a new genus, *Seismosaurus*, but clearly not distinct from *Diplodocus* (B. Curtice, pers. comm., 2000); (2) an animal 39-52 m long, with 46 m the "reasonable estimate" (Gillette, 1994, p. 186), but, when the bones are isometrically scaled, the animal was only 33 m long (Paul, 1988, 1994); and (3) an animal with an extensive "crop" of gastroliths, which are actually hydraulically concentrated cobbles washed among the bones of the skeleton (Lucas, 2000).

Laguna

The Peterson site (NMMNH L-3282) near Laguna is the singlemost extensive Jurassic dinosaur locality in New Mexico. Only this site qualifies as a large dinosaur quarry, where multiple individuals (mostly sauropods) are present in a complex, multistoried fluvial sandstone of the Brushy Basin Member. Most of the sauropod material is diplodocid (Lucas et al., 1996), and Williamson and Chure (1996) described bones of a large allosaurid from the site. Taphonomic analysis of the quarry suggests it is a fluvially concentrated assemblage, as are most of the large Morrison dinosaur quarries (Peterson et al., 1999; Heckert et al., 2000).

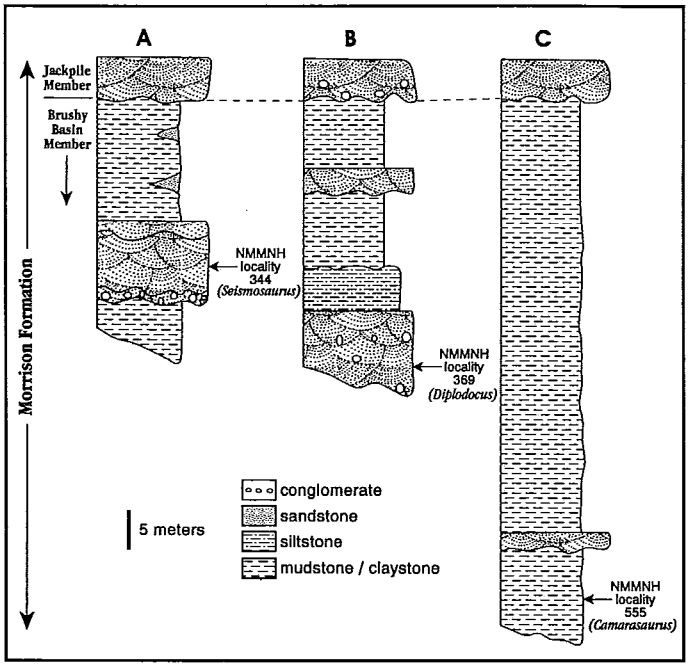

FIGURE 2. Stratigraphic distribution of dinosaurs in the Jurassic of the San Ysidro area, New Mexico (after Anderson and Lucas, 1996). Locations of sections are: A, NW1/4 NE 1/4 sec. 26, T15N, R1W; B, NW1/4 NW1/4 sec. 17, T15N, R1E; C, SE1/4 SW1/4 sec. 22, T15N, R 1E.

DISCUSSION

New Mexico's record of Jurassic dinosaurs remains scanty by the standards of most western states. However, the identified taxa from the Brushy Basin Member, particularly *Camarasaurus*, *Diplodocus*, *Apatosaurus*, *Stegosaurus*, and *Allosaurus*, are all index taxa of the Comobluffian land vertebrate faunachron (lvf) of Late Jurassic age (Lucas, 1993). These taxa support the obvious correlation of New Mexico's Brushy Basin Member localities to numerous other quarries in the Brushy Basin Member in Oklahoma, Colorado, Utah, Wyoming, and South Dakota. Indeed, until such time as most Morrison dinosaurs are revised at the species level and placed in a detailed stratigraphic framework, further biostratigraphic and biochronologic subdivision of the Morrison Formation is nearly impossible.

Thus, while New Mexico's sparse record of Jurassic dinosaurs is not readily interpreted, the following points can be made:

- The sauropod record in the Summerville Formation is among the oldest North American sauropods, although apparently of Late Jurassic age.
- The oldest record of theropod-dinosaur eggshell is from the New Mexico Morrison Formation.
- Generically identifiable Morrison Formation dinosaurs from New Mexico are *Camarasaurus*, *Diplodocus*, *Apatosaurus*, *Allosaurus*, and *Stegosaurus*, all taxa characteristic of the Morrison Formation dinosaur fauna throughout the Western Interior and the Comobluffian lvf (Lucas, 1993). This indicates no provincialization or uniqueness of the dinosaurs in the New Mexican portion of the Morrison basin (Foster, 2000).
- The generic distinctiveness, huge size and extensive gastroliths of "*Seismosaurus*" have, through careful re-evaluation, been shown to lack a sound scientific basis.
- The Peterson site in the Brushy Basin Member of the Morrison Formation near Laguna has emerged as the most extensive and most significant Jurassic dinosaur locality in New Mexico. It is a fluvially-concentrated bonebed dominated by diplodocid sauropods

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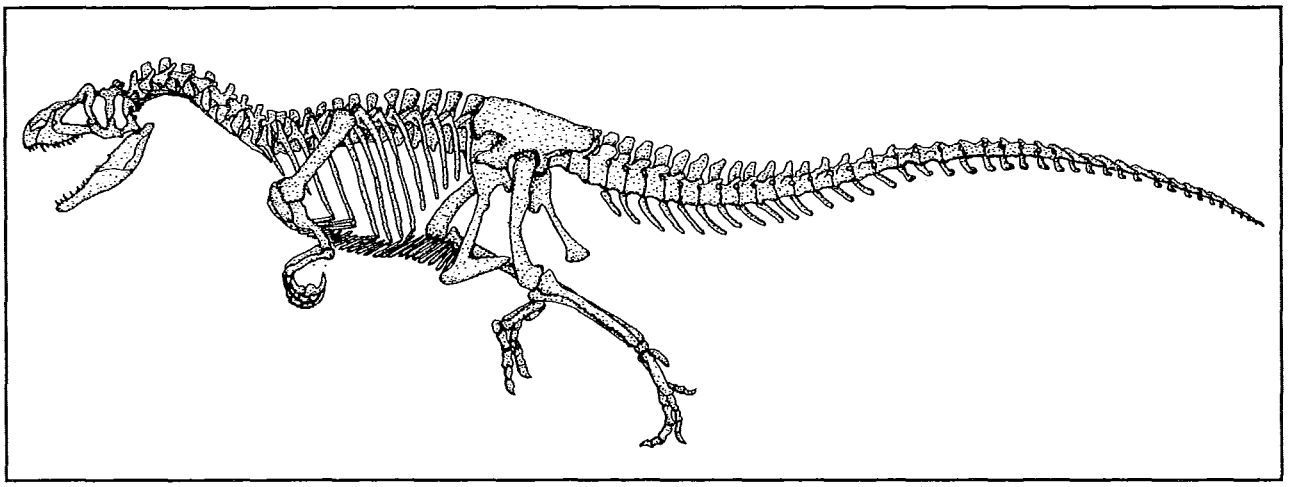

Allosaurus was the dominant theropod dinosaur in western North America during the Late Jurassic.